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“I’m just not feeling it”: Affective processing of episodic physical activity memories differs between physically active and inactive individuals

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A B S T R A C T

Despite widespread awareness of the physiological and psychological benefits of physical activity, many individuals do not meet recommended guidelines. The current research investigated whether episodic memories of physical activity experiences and the emotions elicited by such memories differ between active and inactive individuals. A total of 40 active individuals (36 females, 4 males; Age $\overline{X} = 20.40$) and 36 inactive individuals (31 females, 5 males Age $\overline{X} = 22.67$) were asked to retrieve positive and negative memories of physical activity experiences and to rate them for phenomenological characteristics such as vividness, coherence, remembered emotion, and the emotions elicited when recalling those experiences. There was no difference between the active and inactive individuals in the remembered emotion of negative physical activity memories, but the positive memories recalled by active individuals were rated as more positive than those recalled by inactive individuals. The memories recalled by active individuals also elicited ‘in the moment’ emotions that were more positive for positive memories, and less negative for negative memories, compared to those recalled by inactive individuals. The findings are in line with hedonistic theories of physical activity engagement and suggest that futher research exploring the role of physical activity memories, and their associated affective processing, is warranted.

It is widely accepted that engaging in physical activity provides both physiological and psychological benefits (World Health Organization [WHO], 2020), with insufficient physical activity being one of the ten leading global risk factors for mortality (WHO, 2009). However, recent global estimates suggest that 27.5% of adults and 81% of adolescents do not meet recommended guidelines for physical activity, and that these figures have not improved across the last two decades (Guthold et al, 2018, 2020). Improving physical activity engagement is now a worldwide priority (WHO, 2020). Thus, a core facet of exercise psychology has been to try and understand the factors that affect motivation for, and engagement in, physical activity.

For many years, social cognitive approaches were dominant in the understanding and promotion of physical activity. These approaches discuss how intentions to engage in physical activity are formed from the expectancies one holds about behavioural outcomes (e.g benefits/barriers, attitudes, outcomes expectations) and/or one’s capability to enact a behaviour (e.g. self-efficacy, behavioural control, competence). Therefore, interventions focus on promoting the value of physical activity and modifying expectations of capability (Rhodes et al, 2019). Whilst the vast majority of people are aware of the health benefits and cite an intention to be physically active, these intentions do not translate into action for approximately half of all individuals (Rhodes & de Bruijn, 2013). Arguably, therefore, promotion of health benefits is insufficient as a mechanism to improve engagement in physical activity (Maltagliati et al, 2022).

More recently, there has been a growing interest in the role of affective factors in explaining, and improving, physical activity engagement (e.g. Brand & Ekkekakis, 2018; Conner et al., 2015; Conroy & Berry, 2017; Ekkekakis, 2017; Maltagliati et al, 2022; Stevens et al, 2020). For instance, the Affect and Health Behavior Framework (AHBF; Williams & Evans, 2014) discusses a range of potential affective determinants of health behaviours. These include an individual’s *affective responses*, which refer to how one feels while performing and/or immediately after physical activity and, also, the individual’s *affective processing*, which refers to one’s cognitive processing of previous affective responses to physical activity (Stevens et al, 2020). The latter can occur through automatic and reflective pathways and these ideas have been formalised within models such as the Affective-Reflective Theory of physical inactivity and exercise (ART: Brand & Ekkekakis, 2018) and the Theory of Effort Minimization in Physical Activity (TEMPA: Cheval & Boisgontier, 2021). These models suggest that automatic affect-driven processes interact with conscious reflective-evaluative processes to shape physical activity and sedentary behaviour. A critical factor within these models is that physical activity-related stimuli (e.g. an advertisement for membership offers at a local gym) cue associated cognitive and affective information held within long-term memory. Initially, this takes the form of an automatic affective valuation that is a function of the relative strength of the positive and negative associations within

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memory. However, if sufficient self-control resources are available, then a slower and more effortful reflective evaluation process can follow. This evaluation can involve conscious consideration of physical activity-related affective states, derived from previous experience and/or mental simulation of possible future experiences, along with higher-order cognitive reasoning incorporating subjective beliefs and attitudes about physical activity. Of critical importance to these models, therefore, is the database of physical activity-related information held within long-term memory; specifically, these models suggest that an individual's *episodic memories* of physical activity experiences, and how these experiences are interpreted in the present, may be critical in determining future physical activity behaviour.

Episodic memories are summary records of specific experiences held within autobiographical memory; the human memory system whereby past experiences are integrated into an overarching life narrative (Fivush, 2011). Episodic memories are not stored as literal records of events within memory, but rather they are transitory dynamic mental constructions. Thus, in response to an associated cue, the constituent details, such as sensory, perceptual, conceptual, and affective information about that event, are pieced together so the individual can mentally re-experience the event. Evidence suggests that this reconstructive process can be cued directly, through automatic processes, or generatively, using a conscious and deliberate search mechanism (Conway & Pleydell-Pearce, 2000; Haque & Conway, 2001; Uzer et al, 2012). Therefore, when physical activity-related stimuli are encountered, episodic details pertaining to past physical activity experiences are likely to be activated and episodic memories reconstructed. The affective processing associated with the recall of past events can include *remembered emotions*, which involves recalling the affective responses one had when the events occurred. Furthermore, cognitively reconstructing these memories elicits 'in the moment' emotions at the point of recall (termed *elicited emotions* going forwards).

The reconstructive nature of episodic recall means that it is a bias-prone process and the recollection of a particular experience can vary, for instance, as a function of time, cue type, mood state or current goals (Conway, 2009; Conway & Pleydell-Pearce, 2000). Such biases have been specifically evidenced with respect to physical activity; for instance, Zenko et al (2016) demonstrated that bouts of physical activity that ended pleasantly, whereby cycling intensity was decreased across the session rather than increased, were remembered more pleasantly up to 7 days post-activity. The bias-prone nature of episodic memory is important in the context of physical activity because it is argued that people do not necessarily repeat the experiences that gave them most pleasure, but rather the experiences that have left them with the most favourable memories (Kahneman et al, 1993). Thus, it is this affective processing of past events, in terms of both remembered and elicited emotions, that potentially holds a critical influence on one's cognitive appraisals about physical activity and one's likelihood to engage in, or disengage from, physical activity in the future. Kwan et al (2017) provide inital support for the potential role of remembered emotion, where

remembered affect reported immediately after a 30 min treadmill session was associated with intentions to exercise and exercise behaviour over the subsequent 7 days. However, at present, we know little about the affective processing, in terms of both remembered and elicited emotions, associated with the broader spectrum of episodic physical activity memories held within autobiographical memory.

The affective information that accompanies episodic memory recall forms part of a wider recollective experience that also includes one's mental representations of the event. For instance, recall may be accompanied by mental representations that are vivid, rich in sensory detail and recalled from the first-person perspective, to the extent that one feels like one is re-experiencing it in the present. Alternatively, it might be hazy, incoherent, contain minimal sensory information, and/or be envisaged from a, more distant, third-person perspective (D'Argembeau et al., 2003). Together, the affective processing and mental representations accompanying memory recall are often referred to as the memory's phenomenological characteristics; they have been widely investigated and shown to be influenced by a range of factors including memory type/valence, temporal distance and individual differences (e.g. D'Argembeau & Van der Linden, 2004; Rasmussen & Berntsen, 2009). The phenomenological differences evidenced across different memories and individuals are considered important because they have been implicated in the functionality of episodic memories. For instance, memories that are highly vivid, coherent, that produce emotionally intense feelings and that are closely aligned with one's identity are more likely to guide and drive behaviour towards achieving one's goals (Pillemer, 2003; Sutin et al, 2021).

Arguably, therefore, episodic memories sit at the heart of the cognitive-affective processes that could determine whether an individual engages in physical activity or remains inactive. Considering this potentially fundamental role, surprisingly little is known about episodic physical activity memories and how they might differ among those who engage in varying amounts of physical activity. Whilst it is likely that most individuals can recall episodic memories of both positive and negative physical activity experiences from across their lifespan, the recollective experience that accompanies the recall of these episodes may differ across individuals. For example, inactive individuals might have negative physical activity memories that are more vivid, and elicit more intense negative affect, than active individuals. Understanding the content and phenomenology of inactive individuals' memories might provide insights into how these past experiences could serve as cognitive barriers to physical activity. Comparatively, understanding the phenomenology of active individuals' memories might give further understanding of the aspects of past experience that drive their continued engagement in physical activity.

Therefore, the current investigation aimed to establish whether there are differences in the phenomenology of physical activity memories between physically active and inactive individuals. Functional theories of memory (e.g. Pillemar, 2003) suggest that memories associated with current goals and identity tend to be phenomenologically rich. Therefore, in line with this, it is proposed that physically active individuals are likely to have more vivid and detailed mental representations of memories of physical activity experiences, particularly those that are positive in valence. In contrast, it is suggested that inactive individuals might have more phenomenologically muted mental representations of memories related to positive physical activity experiences. Furthermore, hedonistic theories of physical activity motivation (e.g. Brand & Ekkekakis, 2018; Cheval & Boisgontier, 2021; Stevens et al, 2020) suggest that the remembered and elicited affect associated with past physical activity may serve as facilitators/barriers to physical activity engagement. Therefore, physically active individuals may have memories that are more likely to serve as affective facilitators, yielding more positive remembered and elicited emotions. In contrast, the memories of physically inactive individuals could contain features more likely to serve as affective barriers; for instance, negative physical activity memories that elicit strong negative emotions when recalled. Therefore, it was hypothesised that active, compared with inactive, individuals would consider their positive physical activity memories to be more vivid, coherent, containing more sensory details and feelings of re-living, and that their memories would be perceived more from a first-person rather than a third-person perspective. Furthermore, it was hypothesised that active individuals would experience more positive and intense emotions when recalling their positive physical activity memories. Conversely, it was hypothesised that inactive, compared with active, individuals would rate their negative physical activity memories as being more vivid, coherent, containing more sensory details and feeling of re-living, and that their memories would be perceived more from a first, rather than third, person perspective. In addition, inactive individuals would experience more negative and intense emotions when recalling their negative physical activity memories.

It is feasible that any differences between active and inactive individuals with respect to memory phenomenology could be explained by differences in the content of the reported physical activity memories. For instance, previous research has suggested that the intensity of physical activity is a significant determinant of affective responses, with higher, compared with lower, intensities of activity eliciting more negative emotions (Ekkekakis et al, 2011). Additionally, other work has suggested that both group-based and outdoor activities are associated with better psychological health outcomes, compared with physical activities completed alone and/or indoors (e.g. Eime et al, 2013; Thompson Coon et al., 2011). Examining differences in the content of the memories recalled may, therefore, elucidate on factors that might underpin any differences in the phenomenological experience. For instance, the previous literature outlined above suggests that the recollection of episodes involving low intensity, group-based and outdoor activities could be accompanied by more positive affective processing. Memories were therefore content-coded for their social (i.e., were they engaging in physical activity individually/solo or as part of a group?), environmental (i.e., did they engage in physical activity indoors or outdoors?) context and the intensity of the physical activity (i.e. was the activity reported strenuous, moderate or mild intensity?). Finally, some research has suggested that negative school-based PE experiences impact later physical activity engagement (Cardinal et al, 2013; Lauristalo, 2012). Thus, all memories were also content-coded for their education context (i.e., did the activity activity occur at school or outside school?). These content analyses were exploratory, therefore we made no explicit hypotheses about whether differences would emerge between the active and inactive individuals.

1. Method

1.1. Design & participants

This study employed a 2 (physical activity status: active vs inactive) x 2 (manipulated valence of memory: positive vs negative) mixed design, with repeated measures on the latter factor. Whilst the temporal parameters of memory recall were also manipulated (recent vs. distant), this served primarily as a mechanism by which to obtain a representative sample of different types of memories rather than as an independent variable of investigative interest. The primary dependent variables were the characteristics ratings measuring memory phenomenology (vividness, coherence, sensory details, re-living, perspective, remembered emotional valence, elicited emotional valence, elicited emotional intensity). Of secondary interest were the intensity (high vs. moderate vs low vs. undefinable) of the reported activities, along with the social (solo vs. group vs. undefinable), environmental (indoor vs. outdoor vs. undefinable) and educational (school vs. non-school vs. undefinable) contexts of the memories.

Previous research examining group differences in memory phenomenological characteristic ratings was used to determine appropriate sample size (e.g. Anderson & Evans, 2015). A priori power analysis conducted using G*Power 3.1 (Faul et al, 2009) indicated that samples of 36 participants per group are sufficient to achieve power (1-β err prob) = .80 to observe group differences with a = .05 for a medium effect size f = .20. Physical activity status (active vs inactive) was determined post-participation, using a combination of recommended cut-off scores for the Godin Leisure Time Exercise Questionnaire (GLTEQ: Godin & Shepherd, 1985) and the algorithmic scoring cut-offs for the recreational physical activity domain of the International Physical Activity Questionnaire-Long Form (IPAQ-LF; Craig at al., 2003) as summarised in figure 1. The two independent measures of recreational physical activity were combined to try and minimise bias and misreporting that can hamper such self-report measures (Helmerhorst et al, 2012). These criteria meant some participants would be unclassifiable as either an active or inactive; therefore, a policy of over-recruitment was employed, with 123 undergraduates (111 females, 12 males) aged between 18 and 47 years ($\overline{X} = 21.64$ $SD = 5.29$) completing the study using an opportunistic sampling method in exchange for course credit. Ethical approval was granted by the Faculty Ethics Committee and all participants provided informed consent ahead of participation.

2. Materials

2.1. Godin Leisure Time Exercise Questionnaire

The Godin Leisure Time Exercise Questionnaire (GLTEQ: Godin & Shepherd, 1985) assesses frequency and intensity of physical activity and, together with the IPAQ-LF, was used to classify participants' physical activity status (figure 1). Respondents were asked to indicate how frequently (number of times) they engage in strenuous (e.g. running, cross country skiing, vigorous swimming, judo), moderate (e.g. fast walking, badminton, easy cycling, easy swimming), and mild (e.g. golf, yoga, archery, fishing from river bank) physical activity for 30 min or more in their free time during an average week. Reported frequencies of strenuous activity are multiplied by nine and moderate activities by five and subsequently summed to calculate the individual's overall score. Mild physical activities are unlikely to possess health benefits and, therefore, not included in the summation of physical activity scores. An individual is considered active (substantial benefits) with an overall

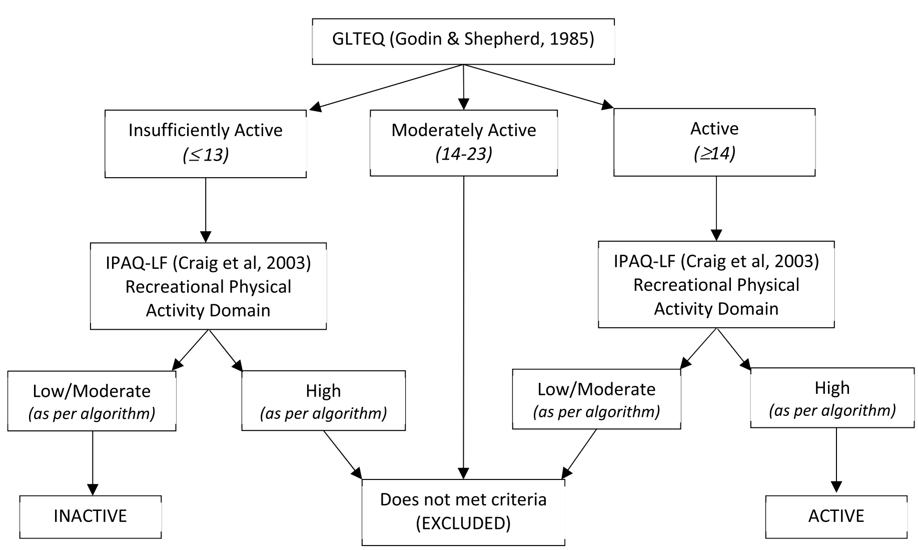

Figure 1. Determination of physical activity status using GLTEQ and IPAQ-LF Recreational Domain Scores.

score of 24 or more, moderately active (some benefits) with a score of 14–23, or insufficiently active (low benefits) with a score of 13 or below (Godin, 2011).

2.2. International physical activity questionnaire – Long Form

The International Physical Activity Questionnaire – Long Form (IPAQ-LF: Craig at al., 2003) is a 31-item questionnaire measuring behaviour across five domains of physical activity and sedentary behaviour. Individuals indicate how many hours/minutes they spend on each of the activities over the past seven days. Within this study, only data from the recreational physical activity domain was used for the purposes of ascertaining physical activity status. In this section of the inventory, participants indicate the time spent engaged in walking, moderate, and vigorous physical activity that was for recreational purposes and not already accounted for in other section of the IPAQ-LF (i.e. as part of their work, for the purposes of transportation, or completing household chores). Data were processed according to the IPAQ protocol (IPAQ Research Committee, 2005). Any single activity bout that exceeds 180 min is truncated and the number of minutes per week for each activity type (walking, moderate activity, vigorous activity) are used to calculate MET minutes per week, which represent the amount of energy expenditure as a function of physical activity. In this calculation, walking minutes per week are multipled by 3.3, moderate physical activity minutes by 4, and vigorous activity minutes by 8, with total METS per week representing the summation of the three resultant values. Individuals can also be classified using an algorithmic method into high, moderate or low levels of activity. An individual is categorised as engaging in high activity if they report vigorous activity 3+ days of the week achieving a minimum of 1500 MET minutes per week or & days of any combination of activity achieving a minimum of 3000 MET minutes a week. An individual is categorised as engaging in moderate activity if they report 3+ days of the week of vigorous intensity activity and/or 5+ days of moderate intensity activity and/or walking at least 30 min per day. Any individual who does not meet criteria for high or moderate activity categories is assigned to the low activity category. This algorithmic categorisation was used, together with the scores on the GLTEQ, to determine each participant's physical activity status (figure 1).

2.3. Centre for Epidemiological Studies Depression Scale – revised

Memory phenomenology has been shown to vary as a function of depressive symptomatology (e.g. Anderson & Evans, 2015). Therefore, to ensure that any differences in memory phenomenology between active and inactive individuals could not be accounted for in this way, severity of depressive symptomatology was assessed using the Centre for Epidemiological Studies Depression Scale – Revised (CESD-R; Eaton et al, 2004). This 20-item self-report questionnaire requires participants to rate, on a five-point scale, their experience of each of the symptoms over the previous two weeks (*not at all/less than 1 day* = 0, *1–2 days* = 1, *3–4 days* = 2, *5–7 days* = 3, *nearly every day for 2 weeks* = 3). The scores are summed to calculate an overall CESD-Style score ranging between 0 and 60, with a higher score indicating a higher level of depressive symptomology.

2.4. Health and injury history

Participants were asked two questions to ascertain whether in the last year, or in the longer term, they had experienced an injury or health related issue(s) that may have limited their participation in physical activity. If the participants indicated an injury/issue, then they were given free text space to provide more details if they wished. Participants who indicated a significant injury or health problem were excluded from analyses because their recent physical activity levels are less likely to reflect their typical physical activity levels.

2.5. Episodic physical activity memory task

Adapted from a task used by D'Argembeau and Linden (2004), participants were prompted to provide descriptions of eight episodic physical activity memories. In each case they were told to detail an instance in which they had engaged in physical activity, with the requested temporal parameters (1 month–1 year ago or 5–10 years ago) and valence of memories (positive or negative) manipulated evenly, and presentation randomized, across the eight memories. The temporal parameter manipulation (1 month–1 year ago vs. 5–10 years ago) served primarily to obtain a representative sample of different types of memories, rather than to assess differences between temporally recent versus distant memories per se.

Physical activity was described to participants as *an activity where you felt like your heart was beating faster, you were becoming warmer, feeling sweaty, breathing faster or heavier, finding it difficult to talk (hold a conversation) or finding it difficult to sing the words of a song.* This could include formalised recreational sport/exercise activities, but also encompassed physical activities that occurred in other settings (e.g. work, commuting, gardening etc). This broad definition was used, firstly, because the boundaries between activities being completed for recreational and other purposes are, arguably, blurred (e.g. walking/cycling to work) and, secondly, it made it more likely that inactive individuals would be able to report sufficient physical activity memories.

Participants were also instructed that memories must be specific episodic experiences (i.e. *you need to recall a single event that occurred on one particular day in the past, lasting for at least a few minutes or hours, but no longer than a day*) and that no memories should be repeated. On-screen and verbal instructions were provided to ensure participants understood the requirements of the task. In each case, participants were asked to type as much detail as they could about the memory. Participants were then asked to date the memory (how many months and/or years ago this memory had occurred). If a participant indicated they were unable to generate a specific memory for one of the prompts, the experimenter advanced the participant to the next prompt.

Immediately after detailing each memory, participants were given on-screen instructions to rate that memory for eight phenomenological characteristics (vividness, coherence, sensory details, re-living, perspective, current emotions, emotion intensity, perceived valence). Full details of memory characteristics can be found in table 1. All items were adapted from previous research exploring the phenomenology of episodic memories (e.g. Johnson et al, 1988; Nigro & Neisser, 1983). Each characteristic was rated using a 7-point Likert-scale (−3 to +3).

Memories were coded for the intensity of the reported physical activity, using the guidelines provided by the GLTEQ (Godin & Shepherd, 1985) to differentiate strenuous, moderate and mild physical activities, and three contextual dimensions: the social context (participated

Table 1
Phenomenological characteristics ratings provided for each episodic physical activity memory.

(Vividness) In my mind this memory is … (*-3= cloudy and imageless, +3= as clear & vivid as if I'm experiencing it now*).
(Coherence) The order of events in this memory are clear and tell a coherent story (*-3= not at all, +3= extremely*).
(Sensory details) Remembering this event brings with it a lot of sensory information (images, sounds, tastes, smells etc..) (*-3= not at all, +3= extremely*).
(Re-living) When I think about this memory I can 'bodily' feel myself in the event (*-3= not at all, +3= extremely*).
(Perspective) When I recall the event, I primarily see what happened from a perspective as seen through … (*-3= my own eyes, +3= an observers eyes*).
(Elicited Emotional Valence) The emotions I have now, when I recall the event are … (*-3= extremely negative, +3= extremely positive*).
(Elicited Emotional Intensity) The emotions I have now, when I recall the event are intense (*-3= not at all, +3= extremely*).
(Remembered Emotional Valence) Looking back, I consider this to have been an … (*-3= extremely negative experience, +3= extremely positive experience*).

individually/solo vs. part of a group), education context (school or non-school based) and environmental context (completed indoors or outdoors). A memory was coded as 'undefinable', with respect to intensity/context, if it contained insufficient information to make a categoric decision. All memories were independently double-coded, with both coders unaware of participants' physical activity status. Inter-rater reliability was acceptable (Intensity: $\kappa = .89$, Social Context: $\kappa = .87$, Educational Context: $\kappa = .95$, Environmental Context: $\kappa = .95$). Where the two raters disagreed, each case was discussed and a consensus reached.

The task instructions required participants to recall a specific episodic experience (occurring on one particular day) where they partook in a physical activity activity within specified temporal parameters (either 1 month-1 year ago or 5–10 years ago). All responses were checked to confirm adherence to these requirements and any memory that failed to meet any one of these three requirements was considered erroneous. Firstly, participant's dating of each memory was used to check the temporal parameters. However, as the ability to date memories becomes more difficult as temporal distance increases we allowed some leeway on dates for the 5–10 years category and any memories dated as occurring between 4 years 6 months and 10 years 11 months were accepted. Secondly, the response was checked to ascertain whether it referred to partaking in a physical activity as defined by the task instructions. Memories failing to meet this requirement tended to involve events that were related to physical activity, but did not actually involve partaking in the activity (e.g. *receiving an email to tell me that I did not have a place in the dance squad*). Responses were also considered erroneous if they did not refer to a specific episodic experience. The criteria used for this judgement were adapted from Singer and Blagov (2000). Memories were coded as specific if the event described was a unique occurrence (i.e., the individual recalled an event that is identifiable by the date and time of the event) and did not last longer than a day (i.e., the individual recalled an event that did not last longer than a 24-h period). Any description that did not meet these criteria was coded as non-specific and referred to either repeated events that did not occur on a single day or an event that lasted longer than one day (e.g. *when I started training I went to the gym every day for a month* or *when we went on a sports tour to Prague)*. Specificity judgements were made by two independent raters. Inter-rater reliability was acceptable ($\kappa = .89$) and where there was disagreement a case was discussed and a consensus reached.

2.6. Procedure

Participants were tested in a laboratory setting, seated in individual cubicles, with a maximum of four participants in each testing session. Participants were informed that the study was investigating how different individuals recall their physical activity experiences. After providing informed consent, participants completed the CESD-R in hard copy. The remaining tasks were then completed on a computer, using Qualtrics, starting with their health and injury history, the GLTEQ and the IPAQ-LF. After completing these inventories, participants completed the episodic physical activity memory task.

3. Results

3.1. Data screening

Data were screened for missing data/outliers and parametric test assumptions. In some cases, the assumptions of homoscedasticity and sphericity were violated and, therefore, parametric tests are reported with appropriate corrections.

GLTEQ and IPAQ-LF responses were screened for missing data/outliers and responses were used to determine physical activity status using the criteria outlined in figure 1. Forty-one participants were excluded from the dataset at this stage, either because their physical activity status could not be determined due to incorrect completion on the IPAQ-LF/GLTEQ (1 participant) or because they did not meet criteria to be considered either active or inactive (40 participants). A further two participants were excluded because they declared a health condition or injury that currently limited their physical activity.

The episodic physical activity memory task required participants to recall a specific episodic experience (occurring on one particular day) where they took part in a physical activity activity within specified temporal parameters (either 1 month-1 year ago or 5–10 years ago). All responses were checked to confirm adherence to these requirements as outlined in the method. To establish whether physical activity status influenced task adherence, a 2 (physical activity status: active vs. inactive) x 2 (manipulated valence; positive vs negative) mixed ANOVA assessed the percentage of responses that fulfilled all criteria. No significant difference emerged between active [Positive $\overline{X} = 77.98\%$, $SD = 26.60$; Negative $\overline{X} = 76.80\%$, $SD = 28.41$] and inactive individuals [Positive $\overline{X} = 82.89\%$, $SD = 24.73$; Negative $\overline{X} = 77.52$, $SD = 27.68$], all $Fs \leq 0.78$, all $ps \geq .38$.

The purpose of this study was to explore the phenomenological experience and content of episodic physical activity memories, and whether they differed between active and inactive individuals. Therefore, erroneous responses from the memory task were not included in the main analyses and participants' scores with respect to the phenomenology and content of memories were calculated using only those responses that adhered to task parameters. In line with this, four participants had provided erroneous responses for all four positive and/or negative memory prompts and therefore, all data pertaining to these participants (2 active, 2 inactive) were excluded.

3.2. Demographic data

Following exclusions, a total of 76 participants remained in the dataset, of which 40 were active individuals and 36 were inactive individuals. Demographic data (age, gender) depression severity (CESD-Style score) and physical activity frequency/intensity (GLTEQ score and IPAQ-LF Recreational METS) as a function of physical activity status (active vs inactive) are presented in table 2. Four separate independent samples t-tests were conducted to check whether active and inactive individuals varied in age, depression severity (CESD-Style), and physical activity frequency/intensity (GLTEQ and IPAQ-LF Recreational METS). Levene's test for equality of variances was violated for GLTEQ, IPAQ-LF Recreational METS, scores and age; therefore, for these variables, a t statistic not assuming homogeneity of variance was computed. As expected, the two groups differed on GLTEQ scores, $t(44.58) = 15.54$, $p < .001$, $d = 3.41$, and IPAQ-LF Recreational METS, $t(43.20) = 8.34$, $p < .001$, $d = 1.83$ with active individuals completing significantly more frequent/intense recreational physical activity than inactive individuals. A significant difference was also found for age, $t(58.10) = 2.03$, $p = .047$, $d = 0.48$, with active individuals being significantly younger than inactive individuals. There was no significant difference in CESD-R scores, $t(74) = 0.48$, $p = .63$, $d = 0.11$. Chi square analysis established no significant difference in gender ratio between the active and inactive groups, χ^2 (1,76) $= .27$, $p = .60$, $phi = .06$.

3.3. Memory phenomenology

Mean ratings for memory phenomenological characteristics ratings

Table 2
Demographic information as a function of physical activity status.

	Inactive	Active
Gender (*Male:Female*)	5:31	4:36
Age ($\overline{X}$, *SD*)	22.67 (5.73)	20.40 (3.64)
CESD-Style score ($\overline{X}$, *SD*)	10.86 (9.29)	9.70 (11.63)
GLETQ score ($\overline{X}$, *SD*)	3.61 (4.7)	44.23 (15.97)
IPAQ-LF Recreation METS ($\overline{X}$, *SD*)	292.03 (413.23)	2826.23 (1872.11)

provided by participants in the physical activity episodic memory task, as a function of physical activity status and manipulated valence, can be found in table 3. Each phenomenological characteristic was analysed separately using a 2 (physical activity status: active x inactive) x 2 (manipulated valence: positive vs negative) mixed ANOVAs, with repeated measures on the latter factor. If a significant interaction emerged, pairwise comparisons were conducted with Bonferroni adjustments applied at the level of each analysis.

Phenomenological characteristics ratings of vividness, coherence, sensory details, feelings of bodily reliving and visual perspective assessed the mental representations of the participants' physical activity memories. Main effects of manipulated valence emerged for vividness, $F(1,74) = 14.46, p < .001, \eta_p^2 = .16$, coherence, $F(1,74) = 6.51, p = .01, \eta_p^2 = .08$, and sensory detail, $F(1,74) = 9.56$, $p = .003$, $\eta_p^2 = .11$. Positive memories were more vivid, coherent and contained more sensory detail compared with negative memories. The interaction between physical activity status and manipulated valence was significant with respect to reliving, $F(1,74) = 4.14$, $p = .045$, $\eta_p^2 = .05$. Bonferroni-adjusted pairwise comparisons found that for positive memories, active individuals reported more bodily reliving than inactive individuals ($p = .03$). However, no significant difference was found between active and inactive individuals with respect to negative memories ($p = .70$). All other main effects and interactions involving physical activity status and manipulated valence were not significant for these dependent variables, all *Fs* ≤ 2.89, all *ps* $\geq .09$.

Phenomenological characteristics ratings of remembered emotional valence, elicited emotional valence and elicited emotional intensity assessed the affective processing of the participants' physical activity memories. Significant main effects of valence emerged for all three variables: remembered emotional valence, $F(1,74) = 1027.74, p < .001$, $\eta_p^2 = .93$; elicited emotional valence, $F(1,74) = 876.43$, $p < .001$, $\eta_p^2 = .92$; elicited emotional intensity, $F(1,74) = 19.70$, $p < .001$, $\eta_p^2 = .21$. These findings primarily served as a manipulation check and confirmed that positive, compared with negative, memories were remembered more positively, elicited more positive emotion and more intense emotion. More interestingly, main effects of physical activity status emerged for both elicited emotional valence, $F(1,74) = 4.08, p = .047, \eta_p^2 = .05$, and elicited emotional intensity, $F(1,74) = 11.83$, $p < .001$, $\eta_p^2 = .14$. Active individuals reported that their positive memories elicited more positive emotion and the negative memories elicited less negative emotion compared with the inactive individuals. Furthermore, the active felt more intense elicited emotion on recall of physical activity memories compared to inactive individuals. Whilst no main effect of physical activity status emerged for remembered emotional valence, $F(1,74) = 0.003$, $p = .96$, $\eta_p^2 = .00$, a significant Physical Activity Status x Manipulated Valence did emerge, $F(1,74) = 4.17$, $p = .045$, $\eta_p^2 = .05$. Bonferroni-adjusted pairwise comparisons indicated that active individuals remembered positive physical activity memories to be significantly more positive than inactive individuals ($p = .049$), whilst no differences were found in remembered valence between the two physical activity status groups for negative memories ($p = .16$). The interaction effects for elicited emotional valence and elicited emotional intensity were not significant, both *Fs* ≤ 2.31, all *ps* $\geq .13$.

Table 3
Mean phenomenological characteristic ratings for episodic physical activity memories, as a function of physical activity status and manipulated valence (standard deviations in parentheses).

Memory Characteristic	Active (n = 40)		Inactive (n = 36)	
	Positive	Negative	Positive	Negative
Vividness	1.56 (0.88)	1.09 (0.93)	1.29 (0.99)	0.75 (1.07)
Coherence	1.29 (0.94)	1.03 (0.98)	1.04 (0.96)	0.69 (1.15)
Sensory details	1.06 (1.02)	0.59 (1.13)	0.71 (1.07)	0.38 (1.06)
Bodily Re-experience	1.24 (1.02)	0.90 (1.09)	0.65 (1.27)	0.81 (1.02)
Perspective	−0.91 (1.75)	−0.74 (1.63)	−0.54 (1.74)	−0.74 (1.67)
Elicited Emotional Valence	2.13 (0.56)	−1.42 (0.81)	1.77 (0.58)	−1.43 (0.56)
Elicited Emotional Intensity	0.70 (1.06)	0.01 (1.01)	−0.04 (1.25)	−0.65 (1.05)
Remembered Emotional Valence	2.39 (0.49)	−1.87 (0.80)	2.13 (0.60	−1.61 (0.81)

3.4. Memory content

Memories were content-coded with respect to the intensity of reported physical activity (strenuous/moderate/mild), with those containing insufficient information to make a categoric decision coded as undefinable. Therefore, each memory was assigned to one of four possible coding categories. The mean percentage of memories within each coding category, as a function of physical activity status and manipulated valence, can be found in table 4 and was analysed using a 4 (intensity) x 2 (manipulated valence) x 2 (physical activity status) mixed ANOVA, with repeated measures on the first two factors. The assumption of sphericity had been violated, $X^2(5) = 81.13$, p < .001, thus lower bound corrections were adopted. Significant findings requiring further clarification were explored using pairwise comparisons, with Bonferroni adjustments applied at the level of each separate analysis. There was a significant main effect of intensity, $F(1,74) = 60.05, p < .001, \eta_p^2 = .45$. Significantly fewer memories reported mild intensity activities compared with strenuous ($p < .001$) or moderate ($p < .001$) intensity activities. The percentage of strenuous and moderate intensity activities was not significantly different ($p = .48$). A very small percentage of memories were undefinable and this percentage was significantly smaller than the other three intensity coding categories (all *ps* $< .001$). A significant interaction emerged between intensity and physical activity status, $F(1, 74) = 5.20, p = .03, \eta_p^2 = .06$. Active, compared with inactive, individuals reported significantly fewer memories that were mild intensity ($p < .001$). The percentage of memories that were strenuous

Table 4
Mean percentage of memories across coding categories for physical activity intensity, social context, educational context and environmental context (standard deviations in parentheses).

Memory Context		Active (n = 40)		Inactive (n = 36)	
		Positive	Negative	Positive	Negative
Intensity	Strenuous	43.54 (27.70)	33.07 (28.83)	27.78 (26.20)	31.73 (27.52)
	Moderate	43.54 (28.71)	40.42 (25.43)	45.60 (31.84)	34.72 (25.93)
	Mild	10.21 (20.97)	10.21 (16.72)	25.93 (32.60)	24.78 (24.44)
	Undefinable	2.71 (10.05)	3.33 (16.54)	0.70 (4.17)	2.55 (8.64)
Social Context	Solo	11.46 (22.38)	12.91 (18.68)	17.36 (20.01)	31.02 (25.64)
	Group	75.21 (30.52)	72.50 (23.51)	71.53 (26.75)	51.85 (24.16)
	Undefinable	13.33 (23.78)	14.58 (20.74)	11.11 (18.79)	17.12 (17.59)
Educational Context	School	13.33 (18.08)	22.71 (25.46)	17.13 (21.63)	19.68 (23.41)
	Non-School	77.92 (23.85)	55.00 (32.35)	77.08 (27.92)	73.38 (25.57)
	Undefinable	13.33 (18.08)	22.71 (25.46)	17.13 (21.63)	19.68 (23.41)
Environmental Context	Indoors	17.29 (24.12)	33.75 (28.43)	21.99 (22.02)	28.70 (26.39)
	Outdoors	71.67 (28.36)	47.08 (30.69)	66.44 (23.01)	55.32 (31.33)
	Undefinable	11.04 (22.20)	19.17 (22.90)	11.57 (16.82)	15.97 (28.55)

intensity (p = .06), moderate intensity (p = .68) or undefinable intensity (p = .42) did not differ between active and inactive individuals. All other main effects and interactions involving intensity, physical activity status, or manipulated valence were not significant, all *F*s ≤ 2.20, all *p*s ≥ .14.

Memories were also content-coded for context across three dimensions: social (solo/group), educational (school/non-school) or environmental (indoor/outdoors). Memories containing insufficient information to make a categoric decision were coded as undefinable. Therefore, for each context a memory was assigned to one of three possible coding categories. The mean percentage of memories within each coding category, as a function of physical activity status and manipulated valence, can be found in table 4. Three separate 3 (context) x 2 (manipulated valence) x 2 (physical activity status) mixed ANOVAs, with repeated measures on the first two factors, were conducted in order assess whether the percentage of memories across the three coding categories differed as a function of manipulated valence and physical activity status, with respect to social, educational and environmental context. In all cases, the assumption of sphericity had been violated: social, $X^2(2) = 10.62$, p = .005; educational, $X^2(2) = 8.03$, p = .02, environmental, $X^2(2) = 9.19$, p = .01. Therefore, lower bound corrections were adopted throughout. All significant findings requiring clarification were explored using Bonferroni-adjusted pairwise comparisons at the level of each separate analysis.

With respect to social context (solo vs group vs undefinable), there was a significant main effect of context, F(2, 148) = 138.03, p < .001, η_p^2 = .65. A greater percentage of memories reported group-based, compared with solo, physical activity experiences (p < .001). Furthermore, a significantly smaller percentage of memories were undefinable compared with group coding category (*p* < .001) but no difference between the undefinable and solo coding categories (*p* = .47). This was qualified by a significant Physical Activity Status x Context interaction, *F*(2, 148) = 5.64, *p* = .02, η_p^2 = .07. The percentage of memories that were undefinable did not differ between active and inactive individuals (*p* = .97). However, a larger percentage of the active, compared with inactive, individuals' memories were group-based physical activity activities (*p* = .01). Conversely, a larger percentage of the inactive, compared with the active, individuals' memories reported solo physical activity activities (*p* < .001). The interaction between social context and manipulated valence was also significant, *F*(2,148) = 6.07, *p* = .02, η_p^2 = .08. A larger percentage of solo (*p* = .04) memories were negative, rather than positive. Conversely, a larger percentage of the memories reporting activities occurring as part of a group were positive, rather than negative (*p* = .003). However, there was no difference in the manipulated valence for social context memories categorised as undefinable (*p* = .15). All other main effects and interactions involving social context, physical activity status, or manipulated valence were not significant, all *F*s ≤ 3.57, all *p*s ≥ .06.

The analyses of educational context (school-based vs non-school based vs undefinable) also found a significant main effect of context, *F*(1, 74) = 166.03, *p* < .001, η_p^2 = .69. A significantly smaller percentage of memories were undefinable, compared with both the school (*p* = .049) and non-school coding categories (*p* < .001). Furthermore, a larger percentage of memories reported events occurring outside, rather than within, school (*p* < .001). There was also a significant Context x Manipulated Valence interaction, *F*(1, 174) = 6.87, *p* = .01, η_p^2 = .09. There was no difference in the percentage of school-based positive, compared with negative, memories (*p* = .08). However, a larger percentage of non-school memories were positive, rather than negative (*p* = .002) whilst a larger percentage of the undefinable memories were negative, rather than positive (*p* = .02). All other main effects and interactions involving educational context, physical activity status, or manipulated valence were not significant, all *F*s ≤ 3.67, all *p*s ≥ .06.

Finally, with respect to environmental context (indoor vs outdoor vs undefinable) there was a significant main effect of context, *F*(1, 74) = 74.40, *p* < .001, η_p^2 = .50. A significantly smaller percentage of memories were undefinable, compared with both the indoor (*p* = .04) and outdoor coding (*p* < .001) categories. In addition, there was a significantly smaller percentage of memories that were indoor (*p* < .001) compared to outdoor. There was a significant Content x Manipulated Valence interaction, *F*(2, 148) = 11.09, *p* = .001, η_p^2 = .13. There was no difference in the percentage of undefinable positive, compared with negative, memories (*p* = .09). However, a higher percentage of indoor memories were negative rather than positive (*p* = .002). whilst a larger percentage of the outdoor memories were positive rather than negative (*p* < .001). All other main effects and interactions involving physical activity status, environmental context, or manipulated valence were not significant, all *F*s ≤ 1.64, all *p*s ≥ .20.

4. Discussion

The primary purpose of the current study was to investigate whether there are differences in the phenomenology, both with respect to mental representations and affective processing, of episodic physical activity memories between active and inactive individuals. It was proposed that active individuals would have rich mental representations of past positive physical activity experiences and that these positive physical activity memories would elicit intense positive emotions upon recall. Conversely, inactive individuals would have more muted mental representations of their past positive physical activity experiences and episodic memories of negative physical activity experiences that are phenomenologically detailed and elicit intense negative emotions when recalled. A number of these hypotheses were supported and the findings support arguments suggesting affective responses to past physical activity experiences may play a role in physical activity engagement.

Differences emerged between the active and inactive individuals with respect to the phenomenological characteristics that tapped the affective processing of past physical activity experiences. Whilst active and inactive individuals did not differ in the remembered valence of negative physical activity experiences, they did differ with the remembered valence of positive physical activity experiences. Positive physical activity experiences were remembered as being more positive by active compared with inactive individuals. Further effects were found for elicited emotions, the current 'in the moment' emotions that are felt upon recollection. Recall of positive physical activity memories elicited more positive, whilst recall of negative physical activity memories elicited less negative, 'in the moment' emotion for active compared with inactive individuals. Furthermore, all of these emotions were more intense for active compared with inactive individuals. This is in line with the hypothesis that active individuals would experience more positive and intense emotions when recalling positive physical activity memories. We also anticipated that inactive individuals would experience more negative and intense elicited emotions when recalling their negative physical activity memories. However, whilst they did report that more negative emotions were elicited in response to recalling negative physical activity experiences, they did not rate these emotions as more intense.

In contrast, very little support was found for the hypothesis that the mental representations of episodic memories would differ between active and inactive individuals. The only significant finding to emerge was with respect to bodily reliving where positive, but not negative, memories were accompanied by a greater sense of bodily reliving for the active compared with the inactive individuals. This finding mirrored the effect found for remembered valence. Arguably, it suggests that one more readily mentally immerses oneself into past experiences that are particularly positive. This was investigated with exploratory correlations between bodily reliving and remembered emotion for active and inactive individuals separately; the correlation was significant for active (*r* = .38 *p* = .01), but not for inactive (*r* = .26, *p* = .12), participants. Contrary to hypotheses, however, no differences were found between active and inactive individuals in terms of the vividness, coherence, sensory detail and bodily re-living of physical activity memories. One difference that did emerge, however, was in the age of the active and inactive individuals. Previous literature has evidenced age differences in episodic memories, whereby older adults report richer phenomenology quality within their memories (e.g. Luchetti & Sutin, 2018). However, in our study the inactive participants were older than the active participants, yet where differences in phenomenology quality emerged it was the active participants who provided higher ratings. Therefore, it is unlikely that any phenomenological differences between active and inactive individuals are a function of age differences between the two groups.

Episodic memories are argued to direct future behaviour; one uses them to learn from and build towards future goals (Pillemar, 2003). This notion is supported by research demonstrating that individuals who are able to generate phenomenologically rich memories also tend to report a greater sense of purpose (e.g. Sutin et al, 2021) whilst difficulties in generating phenomenologically rich memories have been linked with problems with future-oriented behaviours such as planning and problem-solving (e.g. Beaman et al, 2007). However, our findings suggest that physically active and inactive individuals possess episodic memories about past physical activity experiences that are, in the main, equally detailed and coherent with respect to their elicited mental representations. Therefore, it does not seem to be the clarity with which one can recall these past experiences that is related to physical activity engagement, or disengagement, in active and inactive individuals respectively.

Instead, our findings support arguments that suggest that affective processing of past experience shapes physical activity behaviour. This is in line with hedonistic theories of physical activity motivation (e.g. Brand & Ekkekakis, 2018; Cheval & Boisgontier, 2021; Stevens et al, 2020). Our data suggest that active and inactive individuals seem to be able to access databases of episodic physical activity memories that are, in many ways, similar. This is evidenced by the lack of difference in the mental representation ratings and similar levels of task adherence across the two groups of participants. However, there were differences between the groups in terms of remembered emotion and elicited emotions. For individuals who regularly engaged in physical activity, the recall of physical activity memories evoked more intense emotional reactions and, in general, these reactions were more positive. Furthermore, they remembered their positive experiences as being more positive than their inactive counterparts. This is important because it is argued that people do not necessarily repeat the experiences that gave them most pleasure, but rather the experiences that have left them with the most favourable memories (Kahneman et al, 1993). Arguably, therefore, these differences may help to explain why active individuals continue to engage in physical activity whilst inactive individuals do not. The positive emotions remembered and elicited by these memories may feed into more positive attitudes about future physical activity and encourage repeated engagement. This fits with theories of physical activity that highlight the importance of positive affective responses in explaining physical activity (e.g. Brand & Ekkekakis, 2018; Cheval & Boisgontier, 2021; Stevens et al, 2020) and with experimental work conducted by Kwan et al (2017) demonstrating that remembered affect immediately following a bout of exercise was associated with subsequent exercise intentions and behaviour. Our data also suggest that inactive individuals feel more negative emotions in response to physical activity memories and these emotional experiences are somewhat muted. These findings are particularly interesting in the context of the TEMPA model (Cheval & Boisgontier, 2021). This model draws upon evolutionary theories suggesting that humans are inherently programmed to minimise effort (e.g. Lieberman, 2015) and, therefore, the processes supporting physical engagement need to be stronger than the processes supporting effort minimisation. Our data, in the context of TEMPA, might suggest that the emotional experiences accompanying the recall of negative physical activity memories in inactive individuals could negatively cloud attitudes about future physical activity being pleasurable, which means the process supporting physical engagement are insufficient to overcome the general tendancy towards effort minimisation and, thus, promotes continued inactivity.

Our study also investigated whether differences in the phenomenological experience of physical activity episodic memories could be linked to the content of the memories. Previous research suggested that the intensity of physical activity is a significant determinant of affective responses. Therefore, we coded all activities reported by participants as strenuous, moderate or mild, using the examples provided in the GLTEQ. We found that inactive individuals reported a higher percentage of low intensity physical activities compared with the active individuals. This is, perhaps, not suprising as we anticipated that the physical activity memories reported by inactive individuals could involve more everyday physical activities, such as walking, rather than formalised leisure-time exercise. It seems difficult to argue that these higher levels of low intensity activity might underpin the more negative elicited emotions that accompanied the recall of these memories given that previous literature suggests it is high intensity activities that tend to be associated with more negative emotions (Ekkekakis et al, 2011). No notable differences were found between active and inactive individuals with respect to environmental (indoor vs outdoor) or educational (school vs non-school) context. However, a significant difference was found with respect to social context; a larger percentage of the active, compared with the inactive, individuals' memories involved group-based exercise activities. Conversely, inactive individuals reported a significantly higher percentage of solo activities compared to the active individuals. Furthermore, our research suggests that these group-based physical activites are more likely to be encoded as positive, rather than negative experiences within memory. Arguably, our findings add further support to the notion that continued physical activity engagement is likely to be supported by the social nature of participation within group-based activities (Eime et al, 2013, Stevens et al., 2021). This previous research has suggested that group-based, compared with individual, physical activities are associated with better psychological health outcomes and that these effects are thought to be due to the social support provided by these types of activity. However, at present, we can only draw tentative conclusions from our analyses of memory content. It was not always possible to determine the intensity or the social, educational or environmental context of the memories and, as such, the number of undefinable memories may be clouding the effects within these analyses. Future research could overcome this by explicitly asking participants to rate the intensity of the recalled activity and identify whether it occurred in a particular context (e.g. as part of a group or individually).

The study reported here represents, to our knowledge, the first study to examine the phenomenological experience and content of episodic physical acitivity memories across active and inactive individuals. However, it not without its limitations. The naturalistic study of autobiographical memories affords the researcher less control than the study of memory experiences created under laboratory conditions. There will inevitably be differences in the types of memories that are retrieved across individuals and arguments can be levelled about the comparability of memories across individuals/groups. However, to gain a full understanding of how the affective processing of past experiences impacts physical activity engagement then we need to use a broad range of techniques including controlled experimental studies alongside more naturalistic studies of the autobiographical memories that have been formed within the real world. In addition, we have made a number of arguments about how our findings lend support to hedonistic theories of physical activity motivation, suggesting that the affect that is remembered and elicited at recall may be a driving force in facilitating physical activity engagement. It is also important to note that the effect sizes within the study are small and, therefore, the differences in affective responses to past experiences of physical activity evidenced between active and inactive individuals may only be a small piece of the puzzle. Furthermore, as our tentative arguments are based on the differences found between active and inactive individuals, it would be important for future research to explore the relationship between the affective processing of past physical activity experiences, future intentions and objective measures of physical activity.

A further point of limitation to note is that our study has focused on the conscious recollection of episodic memories and the control/reflective stages of affective processing. Hedonistic theories of physical activity motivation (e.g. Brand & Ekkekakis, 2018; Cheval & Boisgontier, 2021; Stevens et al, 2020) draw a distinction between automatic and controlled/reflective affective processing. A similar distinction has been made with respect to the recall of episodic memories, whereby they can be cued directly, through automatic processes, or generatively, using a conscious and deliberate search mechanism (Conway & Pleydell-Pearce, 2000; Haque & Conway, 2001; Uzer et al, 2012). Our study has, arguably, focused on the conscious recollection of episodic memories and the control/reflective stages of affective processing. Therefore, future research could also focus on understanding the role of automatic processes, both with respect to episodic memory retrieval and the associated affective processing. One possibility would be to use laboratory-based techniques to elicit involuntary memories in response to physical acitivity cues and/or to capture the automatic affective responses using reaction time tasks or psychophysiological indicators. This could allow the automatic and conscious/reflective affective processing of memories to be conjointly captured.

Limitations notwithstanding, our findings suggest that the conscious phenomenological experience of physical activity memories varies across individuals and that, in particular, active and inactive individuals report different affective processing of their past physical activity experiences. This adds to a growing body of literature that is starting to unravel the ways in which affective mechanisms might underpin physical activity engagement. Critically, if our memories are part of the broader story of physical activity engagement, then what we know about episodic memory from other domains of psychology might be used to inform strategies to increase the uptake of physical activity. For instance, we know that memories are malleable; they can change over time and be modified by new information and experiences (Schacter, 2001). Therapeutic interventions such as imagery rescripting make use of this feature within clinical practice and can reduce the unpleasantness or emotionality of aversive memories (Slofstra et al, 2016). Imagery-based interventions have already shown promising results with respect to physical activity engagement (e.g. Chan & Cameron, 2012). Perhaps, therefore, the malleability of memories could be harnessed to further benefit physical activity interventions. However, in order to do this we need to build on the current study, creating a clearer picture of the role of physical activity memories and the mechanisms by which they might influence physical activity engagement.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The anonymised data supporting this research is openly available from the OSF repository at https://doi.org/10.17605/OSF.IO/YU3N8.

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